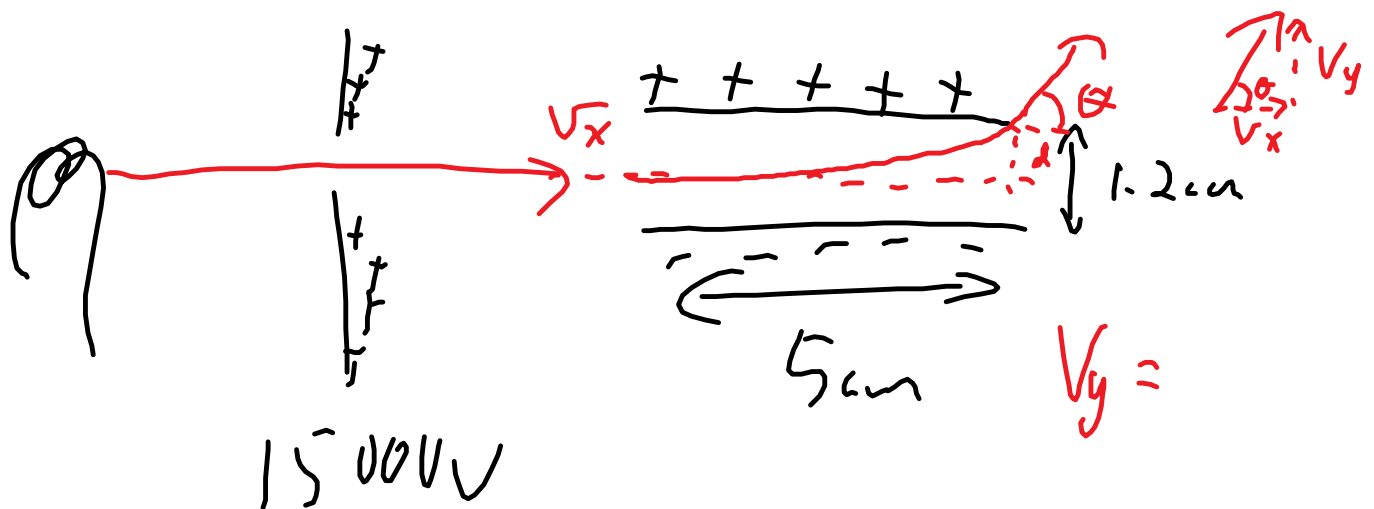


key to CRT - if the electric field is uniform, (between parallel charged plates) then the force is constant - like gravity near Earth. So the motion of the electron will be like a projectile, with a parabolic trajectory.

Q50

$V_a = 15000V$ accelerating plate
deflecting plates 5.0 cm long and 1.2 cm apart
 $V_d = 250V$



$$E_k = V_e = 15000V \times 1.602 \times 10^{-19}C$$

=

$$15000 \times 1.602 = 24030$$

$$2.403 \times 10^{-15}J$$

$$\frac{1}{2}mv^2 = \text{Energy}$$

$$v = \sqrt{2 \times 2.403 \times 10^{-15} / 9.11 \times 10^{-31}} =$$

$$7.26327846433647\text{E}7$$

$$7.26 \times 10^7 \text{ m/s}$$

(ignore relativistic effects)

$$E=V/d = 250/(0.012)=20,833.3333 \text{ N/C}$$

$$F = Eq = 20833 \times 1.602 = 33374.466$$

$$3.337 \times 10^{-15} \text{ N}$$

$$a=F/m = 33374.466\text{E}-19/(9.11\text{E}-31)=$$

$$3.6635\text{E}15 = 3.66 \times 10^{15} \text{ m/s}^2$$

$v=at + 0$ (initial y component of velocity is zero, while the x component is $7.3 \times 10^7 \text{ m/s}$)

$$t=? \quad t=dx/vx = 0.05/7.263=0.0069$$

$$6.9 \times 10^{-10} \text{ s}$$

$$v_y = 3.6635\text{E}15 \times 6.9\text{E}-10 = 2.5278\text{E}6$$

$$v = \text{Sqrt}(2.5278\text{E}6^2 +$$

$$7.26327846433647\text{E}7^2) =$$

$$7.26767581685465\text{E}7$$

$$\theta =$$

$$\text{Atan}(2.5278\text{E}6/7.26327846433647\text{E}7) =$$

$$1.993229922895425$$

2.0°

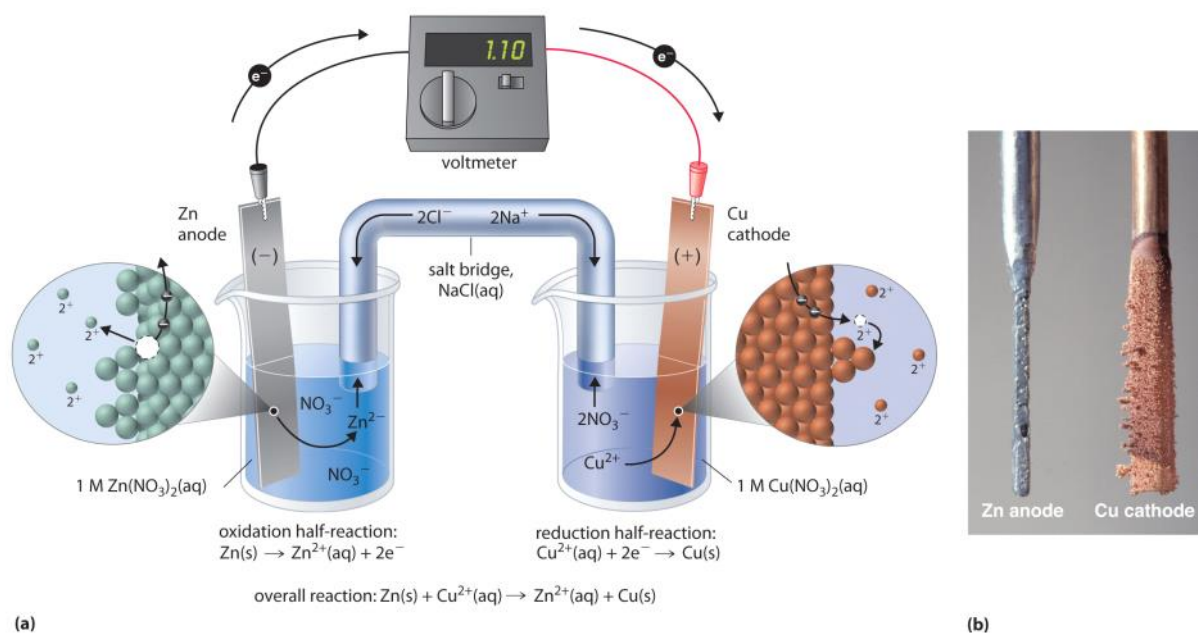
Electric Currents, I

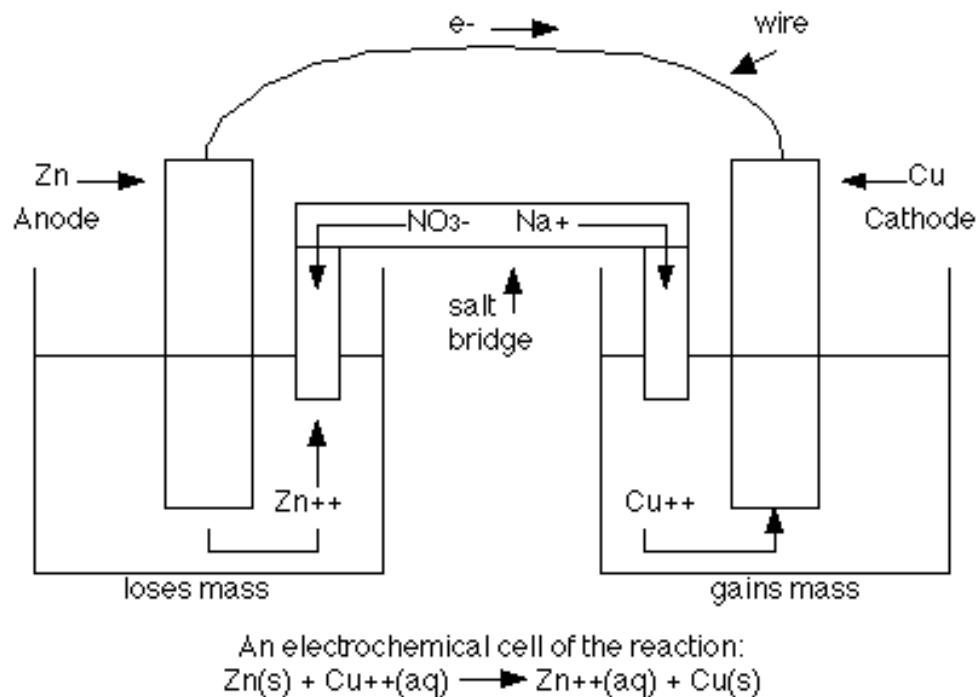
Imagine - Italy

Galvani - iron and copper spikes in frogs, the leg jumps - he thought he discovered the "life force". - related to Frankenstein

Volta - found that putting two different metals into an electrolyte bath resulted in a potential difference - a wire would have a current flow - electric charge transfer.

electrochemical cell





The zinc goes into solution leaving electrons on the anode,

This creates a potential difference between the terminals of the battery, that can be used to create a steady stream of electrons to flow.

$$d = \frac{1}{2} at^2 + ut$$

$$t = \sqrt{(2d/a)} \quad \text{so } t \text{ increases by } \sqrt{6}$$

Q5

$$F = mv^2/r \quad \text{circular motion}$$

F is constant

if v is doubled

$$r = mv^2/F \quad r \text{ must be } 4x$$

Q6

explosions and collision: momentum conserved

explosion - chemical energy is changed into kinetic energy, so it increases

at the top point, $v=0$ so $E_k = 0$, after explosion v is not 0, so E_k increased

Q7 vector addition

Q8 same change in E_g so E_k will be the same (no friction)

Q9 $g_x = GM/r^2$ $g_y = G(2M_x)/(2r_x)^2$

$g_y = 2/4 GM/r^2$ so 0.5 W

Q10

$v = \lambda f = \lambda/T = 20m/(2 \times 2s) = 5.0 \text{ m/s}$

Q12 diffraction - waves bend around barriers

Q13 $L = \lambda/2 = v/2f$ open $L = \lambda/4 = v/4f$ closed lengths are the same so
 $v/2f_1 = v/4f_2$

$4f_2=2f_1$ cross multiply - vs cancel
 f_2